Foam rolling research demonstrates increased ROM without detriment to strength and performance

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There are several massage tools therapists and individuals can use for therapeutic effects similar to massage therapy. The foam roller is a familiar tool in my household used by me, my husband, my parents, and even my kids (although to be fair, my kids see it as more of a toy than a tool).

Foam rolling is associated more with exercise and fitness than with massage therapy alone, but the connection between the two is obvious. Like the cyclical compression-loading approach discussed in the July/August 2018 Somatic Research column used in a rat research model,1 foam rolling is a massage mimetic that applies repeated mechanical load to muscles and tissue to massage and stretch underlying tissues. Purported foam rolling benefits include those related to function, range of motion (ROM), and recovery improvement, in addition to pain and fatigue reduction. Quite a bit of research in the exercise science realm has focused on foam rolling with varying outcomes and almost all has been conducted in athletic or exercise populations, which limits the generalizability of the outcomes.

Massage therapists work with people from all different populations, including those covering the full spectrum of functional ability, health, fitness, and age. When a majority of a particular type of research focuses primarily on a narrow population, it is easy for consumers or observers of that research to conclude a similarly narrow application or population of relevance. Although most foam rolling research has occurred in athletic or fitness populations, findings from these studies can be extrapolated and used to inform massage practice for other populations. As a case in point, this column will focus on a recently published article in the Journal of Strength and Conditioning Research and discuss its findings in relation to massage therapy practice application in broad populations.

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A collaborative endeavor between labs from Canada, Germany, and the United Kingdom examined the extent to which varying levels of mechanical force in the form of rolling massage (RM) affected ROM and performance for young and healthy regular exercisers in the article "Higher Quadriceps Roller Massage Forces Do Not Amplify Range-of-Motion Increases nor Impair Strength and Jump Performance."2 Previous research efforts indicated roller massage was beneficial for improving ROM, but concern existed about the potential masking impact of high mechanical forces on pain perception as well as optimal muscle function and recovery. To address this concern, these researchers used a study design seeking to understand the impact of different pressure levels (low, moderate, and high) when applying rolling massage.

Study Overview

Researchers used a randomized within subject, repeated measures experimental study design in an effort to identify the optimal rolling force to achieve the greatest ROM benefits without negatively impacting performance. Sixteen healthy people (eight men and eight women) who regularly exercise were recruited and enrolled in the study. Study participants were 22–37 years old, reported no experience with RM, and did either resistance or aerobic training for 20 or more minutes three times a week. There were three testing days for each participant. Each testing day involved the application of a standardized RM intervention. At least 48 hours and no more than four days was between each testing day, and RM depths of low, moderate, and high were randomized across each participant's three testing days. In other words, each participant had testing days with each of the three rolling levels, and the order of which testing days had which rolling depth were randomized. The RM intervention consisted of three 60-second bouts of RM with two minutes between each bout. Each 60-second RM bout consisted of 15 four-second passes paced with a metronome. Each pass began just above the knee at the distal end of the quadriceps, rolled up the thigh to the participant's hip crease, and reverse rolled back to the starting point. The low, moderate, and high RM depths were determined per participant on each testing

day prior to warm-up based on the weighted load for RM that reached a 10 out of 10 on that individual's rate of perceived pain. The low RM level was 50 percent of the applicable day's maximum weight measurement, while the moderate RM level was 70 percent and the high RM level was 90 percent of the applicable day's maximum weight measurement. RM pressure consistency was kept by using a specially designed pressure roller apparatus to deliver the intervention, using weighted plates for the pressure load. Study outcome measures were active and passive ROM, muscle strength in the form of knee extension and flexion maximum voluntary isometric contraction (MVIC), and performance via single leg drop jumps. There were six measurement points within each test day: pre-protocol, baseline (just before the first RM bout), after RM bout 1 (RM1), after RM bout 2 (RM2), after the whole intervention/RM bout 3 (post), and 10 minutes after (post-10) the whole RM intervention. All measures were taken at pre-protocol, baseline, post, and post-10. In addition, ROM and performance (single leg drop jumps) were also measured at RM1 and RM2 to assess the effects of repeated RM bouts.

Data analysis found that there were significant improvements in active and passive ROM immediately and 10 minutes after the RM intervention for all groups and that no between-group differences existed. In other words, RM improved ROM whether performed at low (50 percent), moderate (70 percent), or high (90 percent) pressure loads relative to maximum rate of individualized perceived pain. The RM intervention had no impact on any aspect of the study's performance measure (drop jumps) or knee extension and flexion MVIC (study measures of strength). This study's findings align with other research that indicates RM improves ROM and does not negatively affect muscle strength or performance. This study was also able to demonstrate that RM pressures of 50–90 percent of an individual's maximum rate of perceived pain can improve ROM in healthy, regularly exercising young people without impairing strength or performance.

Practice Application and Relevance

Article titles are important. Titles have the ability to catch readers' attention, convey key items covered, and place the subject matter within the literature context it is contributing to. Article titles also have the potential to be intentionally or unintentionally misleading, which can impact the way the article is received by various audiences. The overall message conveyed in this article's title is initially misleading if the reader does not know the context in which the statement is made and is, therefore, likely unintentionally misleading to certain audiences. A perfunctory read of the title ("Higher quadriceps roller massage forces do not amplify range-of-motion increases nor impair strength and jump performance") leads to a general negative outcomes impression for the study: roller massage isn't beneficial for ROM but doesn't hurt (nothing about helping) strength or performance. However, after reading the article, we learn that ROM improved within each of the three roller massage force levels. The title is simply indicating that more (in this case, deeper/higher pressure) doesn't equal better. In addition, we also learn from the article that static stretching has been demonstrated to lead to performance decrements. Knowing this information and that rolling massage (which stretches muscle) did not decrease strength or jump performance points to roller massage as a potential alternative to static stretching to support ROM when maximum performance is desired.

For massage therapists who work with athletes or in an exercise and/or fitness environment, foam rolling and the related research is likely already integrated into practice. However, principles and takeaways from roller massage research have several avenues for integration into massage practice with nonathlete or fitness-related populations. First, the idea of self-massage or self-myofascial release can be integrated into almost all populations who seek or use massage therapy. Self-massage can also benefit people for whom massage therapy is inaccessible due to out-of-pocket costs or other reasons. Foam rollers or other similar handheld tools can deliver self-applied cyclical mechanical load to massage and stretch underlying tissue between massage therapy treatments, thereby potentially supporting or helping maintain treatment effects between sessions. To my knowledge, research on the extent to

which foam rolling or other self-applied massage or mimetic supports or enhances therapist-applied massage effects between treatments has not been conducted. However, the existing research provides theoretical support for such applications. As a former massage therapist and current massage researcher, I often encourage people I encounter to self-apply massage for pain management and function optimization. Now that I am also familiar with the foam rolling research, I have another tool to encourage people to use for function support.

A key piece to this is also that RM or similar applications need not cause pain or discomfort to be effective with regard to improved function or ROM. This is yet another massage example that debunks the notion of "no pain, no gain." There are many situations in which improved or optimized ROM would be beneficial for nonathletic or non-exercise populations. In many of these cases, the added benefit of not requiring the elicitation of discomfort is a bonus. For example, relationships exist between decreased function and activity in older adults with diminished ROM and muscle strength. This research found that even a low force RM intervention significantly improved ROM after three 60-second bouts. This provides a theoretical foundation that a simple and gentle RM approach could support ROM optimization in elders. This approach could be taught to someone with even limited strength to apply on themselves or with the help of a care ally. While I didn't have the literature support at the time, when my private massage practice consisted of mostly adults 75 and older (early and mid-2000s), I used to give my older adult clients trim paint rollers to rub on their legs, arms, shoulders, and pec areas through their clothes between our appointments. While at the time I used this approach as a way to keep them engaged in our treatment plan and give them meaningful "homework," I feel confident that this self-care also helped support massage treatment effects between the times we saw each other. Now as a researcher, I (or others) could/should develop a study design that tests such treatment theories and related hypotheses.

A final point related to this article is one that applies to much of the massage therapy research conducted in athletic populations: ceiling effects. Ceiling effects occur when the level of (potential) change is above the level that an independent variable can be measured. Athletes perform at peak levels, which leaves little room for improvement. In these situations, it is easy for ceiling effects to occur, making it difficult for potentially subtle massage therapy effects to be apparent or register via measurement.

Research is often conducted in these populations for one or more of these reasons: because they are convenient test subjects, because the research is performance- or exercise-science–based to begin with, or because there are fewer ethical concerns when studying healthy populations. When massage effects are found in these healthy and high-functioning populations, however, it is only logical to expect that similar and magnified effects are possible in less robust populations. When extrapolating study results found in robust populations to those who are fragile or in nonoptimal health, practitioners need to be mindful of adaptation needs and safety considerations. With regard to this study's methods and application to practice, I would never consider applying an RM intervention with the weighted plates apparatus used in this study on a frail older adult—or really, anyone. For research purposes, the apparatus was used to standardize and control for human application variances. In real-world practice and application, such standardization is not required or even desired. Indeed, human application variance is one of the great things about massage therapy.

Conclusion

Foam rolling, roller massage, and/or self-massage techniques have great potential for application in massage therapy practice, whether as a way to support treatment effects between sessions or as a way for people without access to massage to receive massage benefits. Whether at low, moderate, or high levels of pressure relative to individualized perceived pain rates, these approaches are inexpensive and

have supporting evidence to suggest benefit to function without detriment to strength and performance for those who are young and healthy at the very least. Clinical application of these approaches in nonathletic populations are theoretically sound and should be considered by therapists with clients interested in optimizing or supporting ROM-related function.

Notes

1. Niki Munk, “Massage Therapy’s Potential for Muscle Regrowth and Remodeling,” Massage & Bodywork 33, no. 4 (July/August, 2018): 46.

2. Lena Grabow et al., “Higher Quadriceps Roller Massage Forces Do Not Amplify Range-of-Motion Increases nor Impair Strength and Jump Performance,” Journal of Strength & Conditioning Research 32, no. 11 (2018): 3,059–69.

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